Citation:

Affenito SG, Thompson DR, Barton BA, Franko DL, Daniels SR, Obarzanek E, Schreiber GB, Striegel-Moore RH. Breakfast consumption by African-American and white adolescent girls correlates positively with calcium and fiber intake and negatively with body mass index. *J Am Diet Assoc.* 2005 Jun;105(6):938-45.

PubMed ID: 15942545

Study Design:

Longitudinal Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To describe age and race related differences in the consumption of breakfast and examine the association of breakfast intake with calcium and fiber intake and body mass index (BMI), adjusting for total energy intake, physical activity and socioeconomic status.

Inclusion Criteria:

Data from the National Heart Lung and Blood Institute (NHLBI) Growth and Health study cohort was analyzed.

Exclusion Criteria:

All data from the NHLBI cohort was used.

Description of Study Protocol:

Recruitment

2379 African American and white girls, aged 9 and 10 years old were recruited from 3 different sites:

- University of California at Berkeley, recruited from Richmond Unified School District (chosen for equal distribution of race and similar economic situation based on census information) public and parochial schools.
- University of Cincinnati/ Cincinnati Children's Hospital Medical Center, recruited from public and parochial schools in Hamilton County (includes inner city, urban, residential and suburban areas).

- Westat, Inc./Group Health Association, Rockville, MD were randomly selected from a membership listing of families in a large area health maintenance organization with additional white participants recruited from local Girl Scout Troops.

Design: Longitudinal cohort study

Review of longitudinal data including 3-day food record, anthropometric measures, demographic questionnaire and physical activity assessment over 10 visits (9 years).

Blinding used: not specified

Intervention: not applicable

Statistical Analysis

- Generalized estimating equations methods
- Autoregressive structure
- Type III Wald x^2 test for significance
- Null hypothesis

Data Collection Summary:

Timing of Measurements

- Data was collected over 10 visits (within 9 years) as part of the National Heart Lung and Blood Institute Growth and Health Study.
- Height and weight were measured and BMI calculated at each visit.
- Activity assessment was conducted at visit 1, 3, 5, 7 and 10.
- Food intake measured annually with 3-day food records.

Dependent Variables

- Daily calcium intake
- Daily fiber intake
- Body mass index (BMI)

Independent Variables

- Breakfast consumption

Control Variables

- Site
- Race
- Age
- Parental education
- Physical activity
- Total energy intake

Description of Actual Data Sample:

Initial N: 2379 girls (1166 white, 1213 African American)

Attrition (final N): sample sizes varied from visit to visit with retention rates overall high. Visit 2 (96%), 3 (94%), 4 (91%), 7 (82%) and 10 (89%).

Age: participants were 9 or 10 years old at the start of the study

Ethnicity: self-reported White or African American

Other relevant demographics: Income and education level varied greatly. Therefore, socioeconomic status was measured by parents' education level only.

Anthropometrics:

Location:

- University of California at Berkeley
- University of Cincinnati/Cincinnati Children's Hospital Medial Center
- Westat, Inc./Group Health Association, Rockville, MD

Summary of Results:

Key Findings

- Breakfast consumption decreased with age ($x^{2}[10]=1579.38$, $p<0.0001$).
- White girls ate breakfast more often than African American girls ($x^{2}[1]=203.42$, $p<0.0001$), and the racial difference decreased with increasing age.
- Daily calcium intake was significantly associated with eating breakfast ($x^{2}[3]=81.29$, $p<0.0001$).
- Daily fiber intake was significantly associated with eating breakfast ($x^{2}[3]=86.53$, $p<0.001$).
- Girls who ate breakfast more consistently had lower BMI ($x^{2}[1]=14.05$, $p<0.005$).
- Days eating breakfast were predictive of lower BMI in models that adjusted for basic demographics (i.e. site, age and race) but the independent effect of breakfast was no longer significant after parental education, energy intake and physical activity were added to the model.

Author Conclusion:

Breakfast eating decreases with increasing age, frequency of breakfast eating is lower in African-American girls than White girls, and breakfast eating is associated with higher calcium and fiber intake, as well as lower BMI in a simple model that does not include variables such as total energy intake or physical activity. African-American girls consistently consumed breakfast less often than White girls. Frequency of breakfast consumption is positively associated with calcium and fiber intake. Less frequent breakfast consumption is related to increased BMI. Eating breakfast may be associated with healthful behaviors, such as physical activity, which assist in control of body weight.

Reviewer Comments:

Potential blinding protocols were not described though may have been a part of the original study. This a relatively large subject pool but they were recruited differently at each site. Authors note the following limitations:

- *Due to variable annual participation rates, data were not available for all girls through the entire study period*
- *Because varying time periods were used to define the breakfast meal on weekdays and weekends, this may have resulted in missing some eating occasions that may have been viewed as the breakfast meal by subjects*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes

3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	No
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A

6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	N/A
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	N/A
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes

	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes